Is the positron really an antiparticle? A semiclassical model of the electron charge

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J. J. Thomson discovered the electron in 1897. Since then, the concept of the electron has played a leading role in technological progress, despite unanswered basic questions about the nature of the electron. Recently, a new physical paradigm has been proposed that has solved many of the mysteries of physics.

Here, we expand the list of physics mysteries solved by the new paradigm, adding those related to the electron and its charge. We propose a model of the electron and its electric charge, spin, and magnetic moment by applying the concept of the vortex nature of particles. Based on this model, the true nature of the positron becomes clear. This understanding provides details regarding the process of conversion of two photons with an energy of 0.511 MeV into an electron–positron pair.
The new paradigm reveals the causes of various phenomena and reduces the number of required postulates, and its models can be visualized to assist the imagination.

1. Introduction

After the discovery of the electron in 1897 [1], it appeared as though the electron and its properties could not be described by the classical model. Thus, some physicists chose a model-less approach, i.e., quantum mechanics, in which the reasons for various phenomena are not indicated, illustrations are impossible, and the laws of the microworld differ from the traditional laws of nature.

Within the framework of the old paradigm, it is impossible to determine the mechanism by which an electron–positron pair is created from the collision of two gamma quanta. An additional

question arises regarding how a charge can appear, because the gamma quanta did not have a charge. Resolving these issues requires knowledge about the structure of the electron and its charge, knowledge that is not provided by the old paradigm. However, the new paradigm can provide this knowledge.

The new physical paradigm was proposed in 2020 [2], and its concise presentation was published a year later [3]. This paradigm opens up new possibilities for the development of classical models of particles and their properties.

The new paradigm is based on the concept of an unorganized mass, which, when in motion, transforms into ordinary mass. Nikola Tesla called the unorganized mass "the primary substance" [4], indicating that our world of mass was created from this substance. Moreover, he stated that when this primary substance is set in motion, it becomes "gross matter."

Thus, unorganized mass is not simply a medium similar to the ether, but it is actually "the raw material of the universe."

According to Tesla, subatomic particles are vortices of the primary substance. We denote the primary substance as "unorganized mass" to emphasize its similarity to and difference from ordinary mass and the possibility of their interconversion.

Unorganized mass is present everywhere, and although it is invisible, it manifests itself in the phenomenon of gravity. For this phenomenon to occur, the unorganized mass must be inhomogeneous.

We aim to demonstrate that electrical phenomena are based on the same unorganized mass involved in the phenomenon of gravity. To better understand our model of the electron and its properties, it is worth performing a comparison with our model of the gravitational field. Although the latter has already been described in [2], we offer a brief summary of this model here because of its importance for understanding the nature of the electric charge of an electron.

2. Extended definition of gravity

Just as invisible air is necessary for life, there is also an invisible unorganized mass that is necessary for our world and the universe.

There is no pressure inside unorganized mass; therefore, material objects, including photons, pass through unorganized mass without hindrance, hence its invisibility. Nevertheless, inhomogeneous unorganized mass manifests itself as a gravitational field.

In a little-known work of Einstein, John Duffield [5] found a direct indication that the gravitational field is an inhomogeneity of "the energy-density of space."

Thus, the refined concept of a gravitational field can be described as follows:

> A gravitational field is a zone of inhomogeneous unorganized mass with a spatially varying density.

Massive bodies lose part of their mass, creating an increased density of unorganized mass around them. In this manner, massive bodies create a gravitational field around them.

By understanding the nature of a gravitational field, we can easily understand that inhomogeneity among unorganized mass can be created in other ways, not only by massive bodies. This inhomogeneity also arises in the phenomena of dark energy/matter (see [2], [6]).

In the dominant paradigm, gravity is defined by one of its manifestations as the mutual attraction of bodies: the affected body and the force-producing body.

This definition is too narrow, similar to defining water as a liquid falling from the sky during rain. Water does not necessarily fall from the sky, nor does gravity only exist under the attractive force of a massive body.

The extended definition of gravity is as follows:

> Gravity is a phenomenon in which particles and atoms of matter experience acceleration, being in an inhomogeneous zone of unorganized mass.

The direction of gravitational acceleration coincides with the direction of the density gradient of the unorganized mass of a medium [2].

Please note that in several paragraphs, we have combined seemingly completely different phenomena: the birth of the universe during the big bang, the principle of the structure of subatomic particles, and the nature of the gravitational field. Moreover, we also solved the dark energy/matter problem.

At the heart of this unification is only one entity: the primary substance or unorganized mass.

3. Nature of the electric charge of an electron

Although millions of articles and numerous books have been written about the electron, the dominant paradigm does not clarify the nature of its charge.

After the discovery of the electron, unsuccessful attempts were made to create a classical model of the electron and its charge. The charge was presented in the form of a special substance, but with this form, the charge would tear itself apart [7]. To prevent destruction, physicists have developed various restraining forces [8].

In his book "The enigmatic electron" [7], M. MacGregor wrote

> "The decision was made very early on that the electron is not a classical entity . . ."

However, the problem did not lie in the electron, but in the limited ability of the conventional paradigm to build models of elementary particles.

As a result, instead of modeling an electron, physics adopted a model-less computational formalism: quantum mechanics [9].

The new paradigm discussed herein opens up new possibilities for the classical modeling of elementary particles and their properties. As presented in Ref. [2], elementary particles are stable vortices of unorganized mass. A density wave circulates inside such a vortex.

In the model of the electron proposed below, the charge is not another substance, but is part of the dynamic structure of the electron vortex.

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Many physicists believe that an electron has a toroidal shape, which is the simplest stable structure of a vortex (Fig. 1).

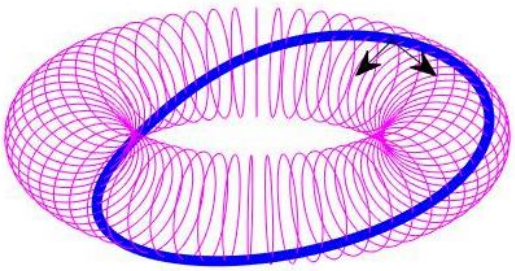

Fig. 1. The blue closed line presents the wave front circulating in an electron. The arrows show two components of the velocity of a point on the wave front: $v_{\perp}$ is perpendicular to the cross-section plane, and $v_{\parallel}$ is in the plane.

The component of the vortex wave velocity $v_{\perp}$ perpendicular to the cross-section plane (see Fig. 1) imparts a large circular rotation to the electron, i.e., spin. Meanwhile, the component of the wave velocity $v_{\parallel}$ in the cross-section plane imparts to the electron the properties of an electric charge.

The boundary between the medium and the wave on the outer surface of the vortex is very sharp [10]. In comparison, the border of

the inner surface of the vortex is less sharp because it is a saddle surface that curves inside in one direction and outside in a different direction. Here, in the region of the electron cavity, there is a mass exchange between the medium and the vortex wave.

When the front of the vortex density wave passes along the inner surface of the electron (see Fig. 2), it entrains the unorganized mass of the medium, thereby reducing the medium density. As a result, a region with a reduced medium density is formed at one pole of the electron. **This is the negative pole of the electron**.

At the exit from the electron cavity, the vortex wave loses part of its mass. Therefore, the medium density here is higher than average. This is the positive pole of the electron.

As a result, a difference in the medium density arises in the electron cavity (see Fig. 2).

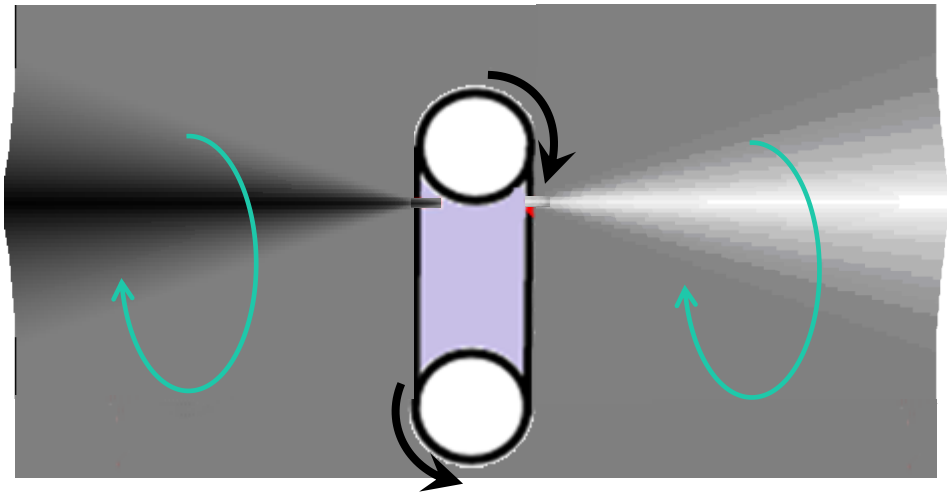

Fig. 2. Illustration of the charge of an electron. Based on gray shading, the change in the medium density is shown as a result of the behavior of the electron vortex. On one side, a region of reduced medium density is formed, and on the opposite side of the electron, a region of increased medium density is formed (the electron is shown schematically as a cross-section).

In our model of an electron, a force is not required to prevent the electric charge from pushing itself apart because the charge of an electron is not a substance, but a state of the environment. The issue of what type of glue holds the charge to the electron also loses all meaning.

The center of the electric dipole is not at the center of the electron, but at the edge of its cavity, where the front of the vortex density wave passes at a given time point. Because the vortex wave circulates in the electron, the dipole exhibits circular motion with the same frequency as the vortex wave.

For clarity, the circular motion of the positive pole of the charge is shown in Fig. 3 from a different perspective, along with the electron. This figure depicts the wave front of the vortex in different phases of its rotation, and the directions of the helical motion of the points on the wave front are also indicated.

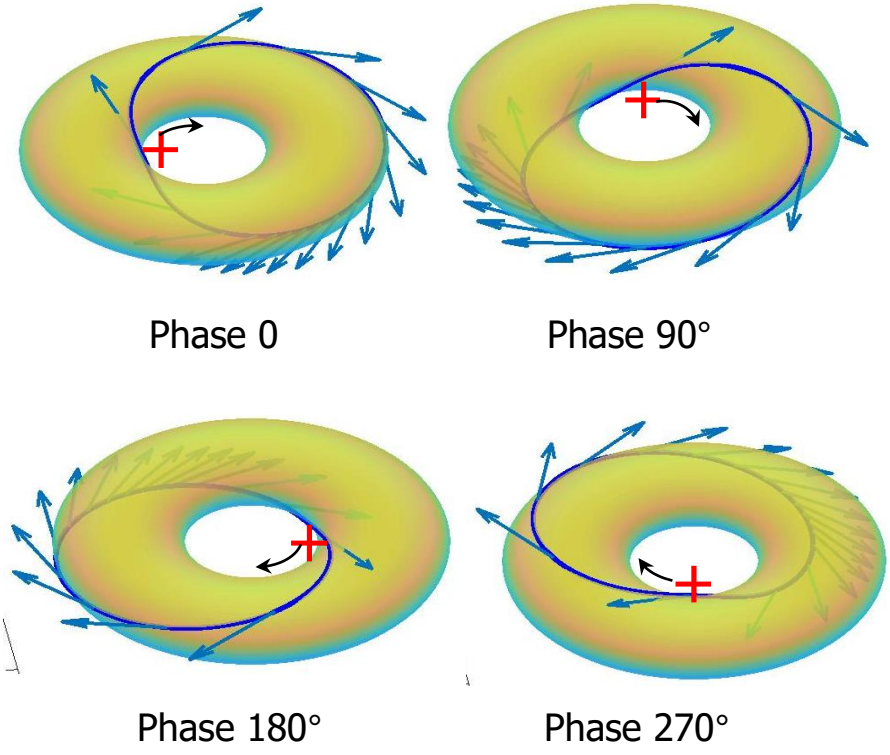

Fig. 3. To illustrate charge rotation in an electron, the vortex wave front line is shown in different phases of rotation. The plus sign indicates the current position of the positive pole, with the negative pole of the electron located on the other side of the toroid. Here,

there is a dragging of unstructured mass from the medium. In those places where the vortex wave front line is drawn faintly, the front line is actually invisible, as it is located on the back side of the toroid.

Thus, this two-pole dynamic inhomogeneity of the medium, called the electric charge of the electron, results from the behavior of the electron vortex and rotates with it.

This rotation creates the electron's magnetic moment.

4. Discussion of the electron charge model

The reader may argue that she/he knows from school that the electron has only a negative charge, while the author of the article claims that the electron has a dipole charge.

Indeed, if an electron is an electric dipole, then its positive charge would have to manifest itself in some type of experiment. Indeed, the positive charge does manifest itself in the creation of electron–positron pairs, but for its interpretation, it was necessary to overcome the previous knowledge received through education.

As a result, the positron was declared an antiparticle.

The very concept of antimatter is questionable. Following the same mathematical logic that led to the idea of antimatter, negative mass-energy entails negative temperatures on the absolute Kelvin scale.

In light of our electron model, the antiparticle positron is not required to explain the result of Anderson's experiment because the electron has its own positive charge. When an electron moves with the positive charge in front, it deflects in the direction opposite to that with a negative charge in front. Thus, there is no need to invent a new particle, especially one with negative mass-inertia.

Among the unsolved problems in physics, we must consider why the symmetry between the number of electrons and positrons is broken in

nature. Why is the CP symmetry hypothesis violated? Why is there far more matter than antimatter in the observable universe [11]?

CP symmetry states that the laws of physics should be the same if a particle is interchanged with its antiparticle (C symmetry) while its spatial coordinates are inverted ("mirror" or P symmetry). A CP violation was discovered in 1964.

Conventional physics does not resolve these issues.

In our interpretation of the formation of electron–positron pairs, instead of a positron, we have the same electron, moving with its positive pole forward. Thus, the question regarding the prevalence of the number of electrons over positrons should be formulated differently: Why does the electron more often move with the negative pole forward rather than the positive pole?

The answer to this question lies in the structure of the electron vortex, which has a predominant direction of motion with the negative pole forward.

This predominant direction arises because the medium density is higher in the vortex center than at the edges. Therefore, when the wave front moves inside the electron (from the negative pole to the positive pole), the wave speed is less than the outside speed.

As a result, the speed of the wave front from the positive pole to the negative pole has an advantage. For the electron to move in the opposite direction, deformation of the vortex along its axis is required, which occurs when two gamma quanta collide.

This finding explains the lack of symmetry between positive and negative electron charges. Similar to why cars are more likely to drive forward than reverse, electrons move forward much more often than backward.

5. Explanation of the creation of an electron–positron pair

The dominant paradigm is unable to explain this process: an electron cannot be born from a single photon, because then the rule of conservation of electric charge would be violated (although the concept of charge is not defined). There remains a variant of two photons sticking together with the creation of antimatter from their mixture, but it is unclear what the antimatter consists of.

Here, we explore whether our proposed model of an electron and its charge can explain the creation of an electron–positron pair in the collision of two gamma quanta with an energy of 0.511 MeV.

Article [12] calculates of the proportions of a free photon. It follows from these calculations that the vortex of a photon is a strongly elongated toroid (Fig. 4). Thus, a photon is topologically identical to an electron, leading to the possibility of a photon converting into an electron.

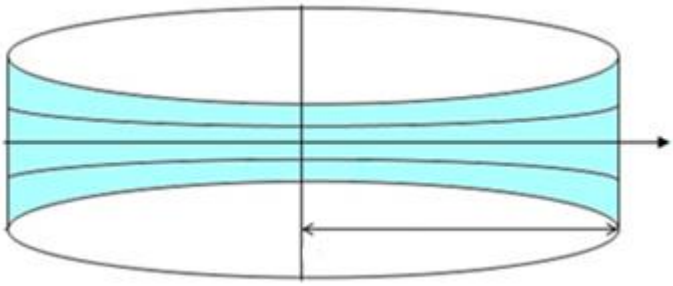

Fig. 4. Cross-section of a photon in free flight according to its proportions (from Ref. [12]).

From the standpoint of the new paradigm, the electron is generally neutral, and thus, there is no violation of the law of conservation of electric charge. Nevertheless, it is unclear how an electric dipole can be obtained from a photon.

Let us consider the properties of an electron charge using its mechanical analogue (see Fig. 5).

Let us consider an apparatus in still air, in which there is an open pipe in the middle (Fig. 5). The air flow exits the nozzle at velocity V_{stream}

relative to the apparatus. As a result, the air density to the right of the apparatus is lower than average, and on the left, the air density is higher.

This analogy is far from perfect because the air medium and unorganized mass have different properties, but the process of mass exchange between the vortex and the medium is similar.

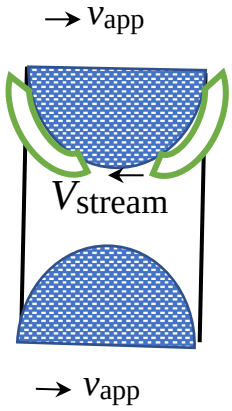

Fig. 5. A mechanical analogue of the electron charge. The air flow from the nozzle creates a difference in the medium density on opposite sides.

When the velocity of the apparatus relative to the air V_{app} equals V_{stream}, the velocity of the flow relative to the air will become zero, which means that the flow will not create a rarefaction in the air behind it or a compaction of the air in front of it.

Thus, from the mechanical analogy of charge, it follows that at a high electron speed, the electron loses its charge and turns into a photon.

However, the opposite is also true: when a photon collides with an obstacle, it slows down and contracts in the longitudinal direction, and its proportions become similar to those of an electron. In this case, the photon acquires an electric charge.

The condition for a stable electron is an energy of 0.511 MeV; hence, a hindered photon with such an energy can transform into an electron.

The foregoing explains the origin of charge in thunderclouds: cosmic ray photons hit the clouds, and owing to the process described above, some of the photons are converted into electrons.

These considerations will aid in the development of more efficient solar cell designs.

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Now we can describe the details of the conversion of two photons with an energy of 0.511 MeV into an electron–positron pair (see Fig. 6).

Stage I. Two photons collide.

Stage II. Two photons stick together and shrink. Electric charges appear.

Stage III. The formed electron and positron separate and travel in different directions in a perpendicular magnetic field.

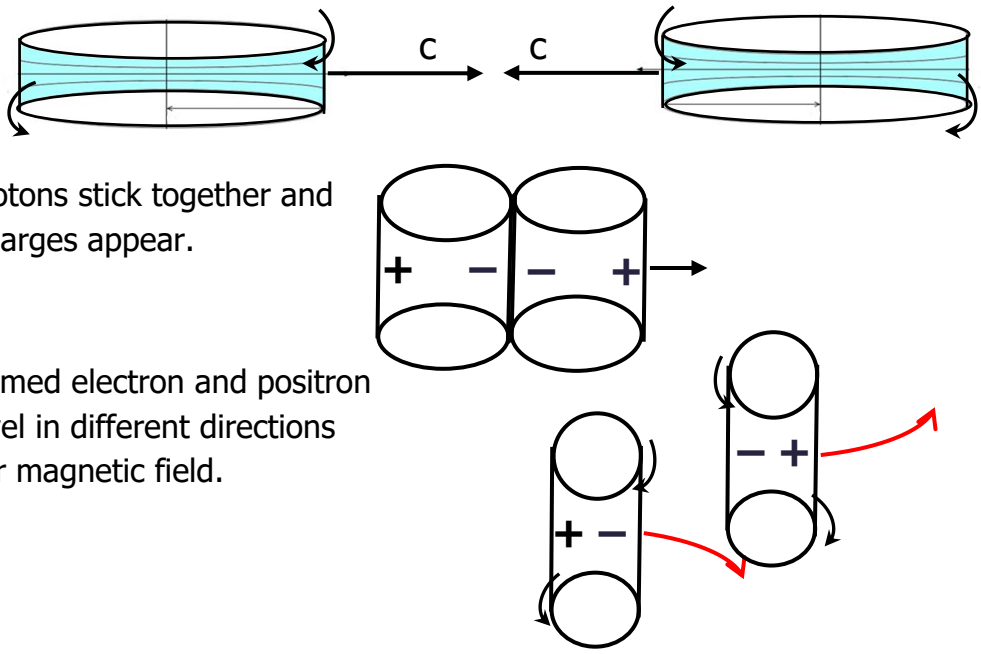

Fig. 6. The stages of collision of two photons. At suitable photon energies, one photon transforms into an ordinary electron (with a negative charge in front of it), and the other transforms into a positron with a positive charge in front. (The magnetic field is perpendicular to the picture.)

When two gamma quanta with suitable energies collide, one of them becomes an electron after deceleration, and the other becomes a positron, i.e., a backward electron.

At stage II in Fig. 6, we see an electron and a positron stuck together, which would seemingly lead to their annihilation. However, both particles are oriented with their negative poles towards each other. Consequently, the particles repel each other, as if two electrons collided.

6. Comparison of the electric field and gravitational field

The discussion in the previous sections indicates that the gravitational field and electric field are different states of the same fundamental medium: unorganized mass.

Unlike the gravitational field of massive bodies, where there is also a density gradient of unorganized mass, the density of unorganized mass inside the electron changes abruptly. In addition, the dipole of the electron rotates with the electron axis. As a result, the electric field of an electron is much stronger and more dynamic than a gravitational field.

Based on the details of the electron vortex, it is clear that the nature of electron interactions depends not only on their position, but also on their orientation.

It would seem that this statement contradicts Coulomb's law, in which the electric field of a point charge is spherically symmetric. However, J. J. Thomson put forth the hypothesis that an electric field consists of vortex tubes of ether. In support of his theory, Thomson deduced Maxwell's equations from the motion of vortex tubes [1], pp.6-12.

Therefore, the electric field in Coulomb's law is the total value at the macroscopic level.

In many ways, our understanding of the electric field is similar to Thomson's theory. Our only addition is to indicate the origin of these tubes.

Next, we consider why charges do not act on neutral atoms or particles. Because neutral atoms or particles have no effect on charges, charges are oriented chaotically near neutral particles, which leads to an averaging of the inhomogeneities of the unorganized mass of the medium. That is, the electric field is extinguished.

In contrast, ions and charged particles orient the charges surrounding them in one direction, which enhances the inhomogeneity of the electric field. In other words, an electric field results from the mutual influence of charges on each other, while neutral particles do not take part in this process.

Thus, the origin of "electric forces" is the same as that of "gravitational forces," but in a gravitational field, particles and atoms play a passive role.

In a gravitational field, charges experience the same acceleration as neutral particles or atoms, but the charges are active. The charges themselves create a local medium inhomogeneity and act on other charges through this inhomogeneity.

This ability of charges to influence the medium density leads to a greater variety of interactions among charges in comparison with gravitational interactions.

7. Electric field in a conductor with current

If a circuit is open, then the conductor's electrons are disoriented. However, in a closed circuit, an electric current results from the ordered movement of electrons along the conductor (Fig. 7).

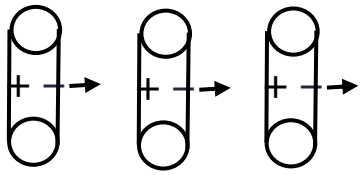

Fig. 7. Electric impact is transmitted through the medium. In Fig. 8, instead of electrons A and C, the state of the medium resulting from these electrons is shown.

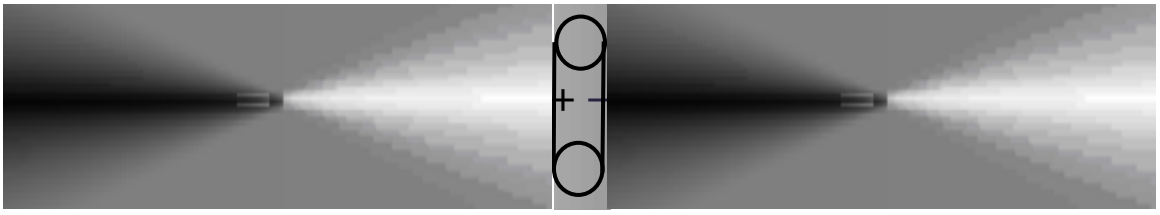

Fig. 8. Electron B is located between electrons A and C. The latter are not shown; rather, only the medium density created by their charges is shown. To the left of B, the medium density is reduced, and to the right, it is increased. Consequently, electron B experiences acceleration to the right as if an electric force is acting on B. In fact, this force has the same origin as the force of gravity.

In a conductor with current, the middle electron is gravitationally accelerated by the positive charge of the neighboring electron to the right and repelled by the negative charge of the neighboring electron to the left. The "electric force" on the average electron is equal to the sum of these two accelerations. The middle electron itself moves forward in the negative direction.

In the dominant paradigm, single-pole electrons repel each other and are unable to set current in motion. They are said to be set in motion by an electric potential, but the mechanism of its operation is unknown.

In the new paradigm, the "potential" of the current source does not propagate in the conductor, but is reproduced along the chain by the conduction electrons themselves.

8. Conclusion

The main advantage of the new paradigm is that it uses causal relationships of phenomena, instead of postulates, to obtain new knowledge. This advantage was clearly demonstrated in this work: starting with the toroidal vortex of an electron, we obtained a cascade of consequences that answer many unresolved questions in physics. Namely, this paradigm resolves the nature of the electric charge and spin, the transformation of a photon into an electron, the process by which clouds become charged, and the nature of an electric field.

In accordance with Occam's razor, we have eliminated an additional entity: the antiparticle positron. Instead of a positron, we suggest a backward electron, which deflects as a positive charge in a magnetic field.

Additionally, we found that the electric field is a special case of the extended concept of a gravitational field.

As a result, our physical picture of the world has become much simpler. Now, the transformation of an electron into a photon does not violate the law of conservation of charge.

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